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P A P E R S

IN

C H E M I S T R Y.



CHEMISTRY.

The THANKS of the SOCIETY were this Session presented to Mr. THOMAS WILLIS, of Lime-street, for the following Communication on the MUCILAGINOUS MATTER of certain VEGETABLES, and their Use as a Substitute for Gum Arabic; being a Continuation of Experiments made upon the subject by him, in addition to those published in the XXth Volume of the Society's Transactions.

SIR,

I HAVE taken the liberty of presenting to the Society for the Encouragement of Arts, &c. specimens of the Powder of Vernal Squills, of White Lily-roots, and of Salop, for their consideration and trial. I believe the

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bulbs

bulbs of the vernal squill will be found to be equally useful as those of the hyacinthus non-scriptus ; and the strong mucilage from the white lily-root and the salop much more so.

As gum-arabic has been at times, during the last war, above 30*l.* per cwt. the multiplication of different substances that will answer the same purposes, will assuredly be an object of a very interesting nature to manufacturers in time of war.

I have sent all the powder of white lily-root I had left ; but am at the present time drying some taken from the garden two or three days ago. As soon as it is powdered, I will send you a large quantity of it.

I am, SIR,

Your most obedient Servant,

THOMAS WILLIS.

March 24, 1803.

CHARLES TAYLOR, Esq.

SIR,

S I R,

FROM the candour and approbation my paper on the use of the Hyacinthus Non-scriptus, as a substitute for gum-arabic, in some trials in calico-printing, met with from the Society for the Encouragement of Arts, &c. I resolved to pursue the subject further; and now offer the following observations for your consideration, in hope that trials may be made, that will be found to be of general benefit.

Having frequently observed, in old gardens, that the vernal squill grew very prolific, I conceived the root of them might be equally as mucilaginous as the roots of the blue bells. I procured three pounds six ounces of them on the 8th July 1802, and sliced and dried them. They produced one pound one ounce of powder, one drachm of which was dissolved in four ounces of

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water,

water, by letting the mixture boil a minute or two. When the liquor was cold, there was a mucilage full as strong as one made with a drachm of the powder of blue bells, in the same proportion of water; from which circumstance, I should think the vernal squill will answer the same purposes as the *hyacinthus non-scriptus*. If it should, it is a root that may be very easily and plentifully propagated, and whenever gum-arabic is dear, may be found useful. It is to be remarked, that I found no pungency in the powder of the vernal squill. I have frequently eaten of it, and the taste is rather agreeable.

On the 18th of August 1802, I collected four pounds of the white lily root, which yielded, when dried, rather more than one pound of powder. A drachm of it was dissolved in four ounces of water, by gently boiling it a minute or two : the mucilage was much
stronger

stronger than that made with the vernal squill, but somewhat darker coloured. This root may possibly answer the same purposes better than those above mentioned. The powder of the lily-root leaves a bitterness on the tongue.

Twelve ounces of the fresh roots of the white lily being bruised and pressed, yielded by evaporation one ounce and one quarter of brown gum.

There being a small quantity of it, I made no trial with it ; but very probably the expressed juice might be used by the calico-printers with advantage. These roots can be procured at all times, and propagated to any extent ; but it must be observed, that these bulbous roots are stronger when they are without stems, or only beginning to shoot out leaves ; and the present time is as proper as any that can be for procuring them.

I tried

I tried comfrey-root; but the dark colour of the cuticle of the root affected the solution, by making it of a dark dirty brown.

I do not pretend to claim any merit in making the above experiments. Every one who is acquainted with these roots, well knows that they are all mucilaginous. My design is only, your patronage, to render them useful in the arts, that their virtues and effects might not lay dormant, but be rendered serviceable to trade.

After making the above trials, the powder of salop-root was used, by dissolving one drachm of it in four ounces of water, in the manner above mentioned. It produced a very strong mucilage, and, when cold, was a perfect jelly, and much clearer than either of the other solutions. I am greatly of opinion, that the powder of this root will not only answer all the purposes of gum-arabic, but will be found full as
cheap

cheap, if not cheaper, in proportion to its strength, than gum-arabic ; but this is submitted to your consideration and trial.

I have sent some specimens of the Powder of the Vernal Squill, of White Lily Root, and also of the Salop Powder, in order that they may be tried by your direction ; and if they should be found of benefit to commerce, nothing would give me greater pleasure, than to find my slender abilities have been of utility to my country, and honoured with the approbation of the Society.

I am, SIR,

Your obedient servant,

THOMAS WILLIS.

March 22, 1803.

MR. CHARLES TAYLOR.

OBSER-

OBSERVATIONS *on the* DRY-ROT *in*
TIMBER.

THE mischief arising in buildings from that decay of the timber and wood-work, known in general by the name of the Dry Rot, has been, and yet continues so great, as to demand every attention for its prevention. In the XIIth Volume of the Transactions of this Society, published in the year 1794, will be found some valuable facts, furnished by Robert Batson, Esq. of Limehouse, respecting the methods he took to prevent this evil, in one of his rooms greatly affected by it. The plan he adopted was, to charr the ends of his timbers, to take away the infected earth to the depth of two feet, and to fill up that space with anchor-smith's ashes, or ashes from a foundry, before his flooring-boards were laid. On the 15th of May, 1794, which was upwards of six years after the flooring

exa-

was laid, as above mentioned, a minute examination of the boards, wainscot, and timbers, was made in the presence of a Committee of the Society, and they were all found entirely free from any appearance of the Rot. To investigate the matter more fully, a further inquiry has been made in June, 1803, and an answer received, that there has been yet no appearance of the Dry Rot there; the Society, therefore, think it may be of consequence to notice the fact, and to insert, in the present Volume, some other papers with which they have been favoured upon the subject. They contain many hints deserving public attention, and which will doubtless tend to check the progress of this evil.

The

The THANKS of the SOCIETY were this Session presented to BENJAMIN JOHNSON, Esq. of Ipswich, for the following Communications on the Origin of that DECAY in TIMBER, which is commonly called the DRY ROT, and the METHODS of curing or preventing it.

SIR,

SOME time between 1771 and 1773, I went, at the request of a friend, to the Chapel at the Lock-Hospital, through curiosity, to examine a pew there, that had frequently been repaired for damages by the dry rot.

After a close investigation, we found that it was the operation of a plant, whose leaf resembled that of the vine. Wherever it had touched, the effect of its poisonous quality got through the wood to the paint, which I have seen a mere skin. I proposed to cover the floor with bricks, laid in mortar, which
was

was accordingly done. I called twice since, the last time about seven years ago ; and have reason to think that it had never appeared again.

The next opportunity of examining it carefully was at Mark-Hall, in Essex, the seat of Mr. Montague Burgoyne. In a parlour there were three pillars of about ten inches in diameter, the out-wood of which was between two and three inches thick. Two of them were eaten through in less than seven years, from the bases, about two feet upward, within the hollow, and were as rotten as if it had been the effect of a hundred years standing. Mr. Montague Burgoyne's gardener was a botanist : we found the plant where I directed him to search for it ; and he said it was the *Boletus Lachrymans*.*

* Some authors call it a parasitical plant ; and it is sometimes to be found with the willow and sallow tribe, but this is not to the purpose. Till within a few months I have never been without some leaves of the plant. For many years they appear exhausted and dead, and soon crumble into dust ; but I suspect that fresh wood attracts a fresh growth from the root.

At another time, I saw it in a house at Whitehall, built by Sir John Vanbrugh, whose nephew then lived in it. The house is, I think, only two stories high ; the plant had ascended to the upper story, committing devastation on the wainscot all the way. It will destroy half-inch deal wainscoting in a year.

I have had it twice in houses I inhabited, one in Suffolk, and the other in Gloucestershire. I bore with the first ; in the other case, I undertook, and did stop it effectually.

The cause is from the floor being laid on the earth, which has been, where I have observed, of a gravelly or sandy loam. The moisture from a water-course at hand, or a North aspect, where the outer wall stands in a garden-bed, so that the rain percolates, are great encouragers : it requires moisture.

It

It never rises in the middle of the floor; because, if the seed were there, it could not germinate for want of air; but it is easy to suppose, that after the floor is shrunk, an air may be created between that, and the vacancy between the wainscot and outer wall, sufficient for the purposes of vegetation:

I saw an instance, last summer, in the house of a friend, a student in botany. He was surprised when I told him, it was a visit from a plant; but so it proved, and always is, and ever was so; nor does it originate from any other cause.

In my own case, I removed the original soil near the part affected, and supplied its place with sand. I then placed pieces of tile; on those I laid mortar, and tiles over them, pushing them under the wainscot, so that it had no communication with the joists or floor. Pillars, in like manner, should be kept from the earth.

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In laying a floor upon the ground, I should take away the earth for a foot in breadth, and four inches in depth, all round the walls, and place the ends of the joists in mortar, covering them with tiles pressed under the floor and wainscot, quite to the outward wall. Iron or tin plates would do, but are not so cheap as mortar and tiles.

This plant has no adhesive powers, but in contact with wood. If it could pass over brick or mortar, it might be seen to spring from the cellars, and in-feet half the houses in the kingdom.

In short, the wainscot is to be kept free from contact with the joists and floor ; and I believe it cannot be better effected than I have described.

I am, SIR,

Your obedient Servant,

BENJAMIN JOHNSON.

December 21, 1799.

To the SECRETARY.

SIR,

SIR,

THE observations I sent yesterday were taken from different parts of my note-book in haste, because the second Tuesday in December was past; for it was by accident I saw the advertisement on Saturday; but wishing not to be deficient in information, I trouble you again.

The leaves of the plant appearing exhausted and dead, is owing to their having imparted all their juices to the wood, which change it to a fungus, and not to a powder, like rottenness from length of time.

The *Boletus Lachrymans* is of the fungus tribe, and is one of the few that have leaves, as the misletoe, &c.

Nothing is more easy than to prevent the damage from the plant. Besides what I said yesterday, I am positive that a tile laid close along the walls

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round

round the room, would prevent the growth of the plant, even without mortar; and perhaps it is only necessary where the walls are next to the air.

Charring the ends of the joists for a few inches, and charring the side of the wainscot at bottom, next to the wall, would be sufficient; for the plant cannot adhere to any thing but wood, and that possessed of its natural juices, to a certain degree; so that I question if old dry oak would receive it.

All the white soft woods, as beech, poplars, and deals, are for a long time ready to receive it. Repairing the damage with fresh wood, without removing the earth and plant, is only feeding the evil.

The plant is of the creeping kind, and cannot rise two inches; so that wood, in all cases, must be in contact with the earth to support it.

A fungus broader than the palm of one's hand, and an inch or more in thick-

thickness, is commonly seen at the bottom of an old post, on the surface of the earth; but it is not easy to discern whether the wood or the earth furnishes the matter; so true is the observation of Muller:—" *Dans l'étude de la nature, on peut nous comparer à de petits enfans qui commencent à ouvrir les yeux; nous voulons parler beaucoup, et nous ne faisons que bégayer.*"

I am, SIR,

Your most obedient Servant,

BENJAMIN JOHNSON.

Ipswich, Dec. 21, 1799.

To the SECRETARY,

N. B. The qualities of this plant are unknown to most English botanists, as appears from their publications; but they are known to the Germans, who have habitually used more wood in their buildings than we have.

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SIR.

S I R,

ASSURED that the pursuits of the Society for the Encouragement of Arts, &c. aim at the full investigation of whatever they propose for the public benefit, I cannot persuade myself that I am troublesome in going a little further into this subject.

I had lately a conversation with an old friend, who showed me two parcels of rotten wood, from an oak barn floor, laid about sixteen years ago. After lying twelve years it shook upon the joists. On examination, it was found to be rotted in various parts, and the planks, two inches and a half in thickness, were nearly eaten through, though the outside was glossy, and without blemish. The joists, and a large middle beam were laid at the ends, in brick and mortar, to create a firm level. No earth was near the wood ; and he thinks
that

that no air could find a passage. The rottenness was partly an impalpable powder, of the colour of Spanish snuff, and other parts were black, as if burnt; the rest was clearly a fungus.

This gentleman is a person of undoubted veracity; but a nice and exact observation is necessary in such examinations. He thought nothing of any plant, and it is likely there was none of the *Boletus*; so that my assertion that it was always to be found, was rather too systematic,

I asked him if the timber was dry when laid down. He could not however say, that had been particularly adverted to. It had been sawed from a large oak, and was, as he thought, in all respects proper for a barn floor. As this seems not the operation of the *Boletus*, how did it happen?

We know that the oak, when in vegetation, is subject to what I shall call an exudation of juices, which produces the

fungus, named the Agaric of the oak, with which the Druids of old played many tricks. The oak, then, if sawed into thick quantities, may emit these same juices, as the progressive course of nature to its entire decay.

We have all seen oaks of vast size and ancient record, with a great part of the outside whole, and all the inside gone; perhaps the work of a century. In all hollow trees fungus is discoverable. To use a law term, it is a *misnomer* to call it dry-rot; for the rotting principle is in moisture.

I had never seen the rot upon so large a scale as in timber, till lately. The prevention, then, of beams, rafters, large joists, and posts, put into the earth, from decay by the rot, is in charring only, which will dry up all the fungus juices of wood in large substance. Paint, or a bituminous preparation, may probably stop up the pores, and prevent the rot in slight work, where the treatment I before observed, with
fire,

fire, might be incommodious, as in half-inch wainscot, &c.

The incorruptibility of charcoal is attested by undoubted historical facts, at the destruction of the famous temple at Ephesus. It was found to have been erected on piles that had been charred; and the charcoal in Herculaneum, after almost 2000 years, was entire and undiminished.

I am, SIR,

Your most obedient Servant,

BENJAMIN JOHNSON.

Ipswich, December 26.

The THANKS of the SOCIETY were this Session presented to RICHARD RAMSDEN BRAMLEY, Esq. of Leeds, for the following Communications, relative to the DRY ROT in Timber.

SIR,

I TAKE the liberty of inclosing to your care an Essay on the Dry Rot in Timber, which you will be so obliging
as

as to lay before the Society for the Encouragement of Arts, &c. Should this Essay be deemed worthy of attention, or should any farther notice be necessary respecting it, every information that may promote the views of your respectable Society will be given with pleasure by,

SIR,

Your most obedient Servant,

R. RAMSDEN BRAMLEY,

Leeds, Aug. 26, 1799.

To the SECRETARY.

AS the Society for the Encouragement of Arts, &c. have for some years offered a premium for the discovery of the cause occasioning the Dry Rot in Timber, of which, it seems, no satisfactory account has yet been received; should the following prove

so.

so, it will give the author much pleasure. To bring the matter to the test by experiments, would require the observation of a long period, and in selected situations.

Wood, used for the general purposes of man, is cut down at different periods; and although it may be felled at the proper season, or when most free from sap or moisture, it is not always to be effected.

Even admitting it to have been cut down in the most favourable situation, it still abounds with such an extra proportion of moisture, as to require a regular exposure to the air, prior to its being applied to use, if we wish to guard against that shrinking which always takes place, where this precaution has not been taken.

Although the fir kind contains less of this watery portion, yet it assuredly possesses a considerable share; and it is in this species, I apprehend, that
the

the evil called the Dry Rot most generally occurs, as from the facility of working the same, it is most generally applied in buildings.

But supposing it to be fir, or any other species; wood felled when abounding with any extra proportion of sap, and applied to use without the proper seasoning or exposure to a free current of air, until such extra moisture has had time to exhale, is most liable to the disease in question; and the cure, or principal prevention against it, would be the precaution of felling all wood *only* at the proper season, or when the sap is not in circulation. The next mode of prevention would be to use such wood only as has been for a considerable period exposed to the influence of a free current of air, or where convenience will admit, to that of air heated to a moderate degree; such air extracting with greater facility the inclosed moisture, and in a more certain

certain ratio than the irregularity of our atmosphere will allow.

In all rapidly-improving countries, this evil is likely to be an increasing one, as the current demand for wood generally exceeds the supplies laid by in store, so as to be applied to use in regular succession, after being properly seasoned.

Another cause that affects all wood most materially, when not fully dried, is the application of paint, the nature of which prevents all exhalation, and confines the inclosed moisture, till it occasions a fermentation through the whole fibrous system of the wood, and brings on a premature state of decomposition, or the Dry Rot.

A similar evil may be induced, in consequence of any newly-finished building having all the doors and windows shut up, and that for some length of time, particularly in moist weather. The wood, even though unpainted, is
thus

thus frequently placed in an atmosphere more charged with vapour than its own internal contents, and is consequently in an imbibing instead of an exhaling state, and tending to decay. Wood placed in dampish situations, and the ends of timbers near to moist walls, suffer from similar causes.

What particularly attracted my observation to the circumstances was this, that both oak and fir posts were brought into this premature state of decay, from their having been painted prior to the due evaporation of their moisture; and then extending the observation, and tracing the history of other wood affected in a similar manner, I am convinced that the evil frequently thus originates, and its prevention would be in using timber, previously well dried and seasoned.

RICHARD RAMSDEN BRAMLEY.

SIR,

S I R,

A considerable time has elapsed since I furnished you with some observations relative to the Dry Rot in timber, and having been since engaged busily in draining from 4 to 5000 acres of ground, further ideas on the subject of the Dry Rot have in the interim recurred to me from the work I have been engaged in, which, if the respectable Society to which you are Secretary think worthy attention, they may add to, or connect with my former ideas, as may be deemed most useful. Where houses are troubled with damp walls, near to the earth's surface, it is generally, if not universally, occasioned by the percolation of water from the higher adjoining ground, which, thus intercepted in its current, attempts to follow the general hydrostatic law, of elevating itself, by the syphon line, to a height equal to that

that from whence it has its origin. Thus, in houses differently situated, we see the damp arising, to varying degrees of height, on the walls; and those are probably all corresponding to the height at which the moisture circulates in the adjoining ground. At its first entrance to the building, and whilst the moisture is in small quantity, the excavated part of the foundation wall may absorb, and gradually quit such proportion; but the excess, as is generally the case in moist weather, exceeding that power, the foundation stones are then saturated in a more rapid proportion than the adjoining rarified internal atmosphere can evaporate; the watery particles then creep up, in degrees proportionate to the ascent from which they originally descended, excepting when prevented; or driven off by the superior heat of the adjoining rooms, when, in addition to the disagreeable damp they cause, they frequently occasion considerable damage

to pictures, furniture, &c. Drains laid out athwart the ascending ground, with a very slight descent or fall, and made of the depth of one yard for each yard of ascent, and from the foundation until equal to the height that such damp ever rises, would, there is little doubt, completely secure the house and furniture from the inconveniences hitherto sustained, and would generally prove an effectual prevention to most cases of the Dry Rot, where it originates in extreme moisture. I am of opinion that the fungus which pervades decaying wood is not the first cause, but an attendant on the peculiar state to which such wood has been reduced by prior causes. The disseminated seeds finding a proper bed, or *nidus*, like to the mushroom, toad-stool, &c. fix there their abode, and pervade the whole substance, thus accelerating the general law of Providence, which tends to make all matter re-productive.

Cellars, or such other places, should be drained in the manner I have above mentioned, by taking off the percolating water, prior to its gaining admission to or contact with the walls; and it is probable that, in most cases, a single drain will have complete effect; it would assuredly do so, if it was not for the variation of the earth's internal strata, which are not easily discernible. If attention to this rule was paid prior to the building any new streets in towns, it would prove essentially useful.

I am, with esteem,

Dear SIR,

Yours truly,

R. RAMSDEN BRAMLEY.

Leeds, June, 1803.

To Mr. CHARLES TAYLOR.

The

THE Society have been informed, that mortar made of lime from burnt chalk is much more destructive to timber than stone lime, or that burnt from lime-stone. Chalk lime attracts moisture; and communicating it to any timber which it touches, occasions its decay.

Sea sand is also prejudicial, if made into mortar, from a similar quality of attracting moisture from the atmosphere: this may in some degree be corrected by washing the sand well in fresh water, where good sand cannot be procured.

Good mortar, where any is required to be in contact with timber, may be made from a mixture of stone lime fresh burnt, and river sand, to which a very small quantity of common brown, or yellow iron ochre, should be added, and well incorporated therewith.